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ABSTRACT

A PROGRAM DESIGNED TO DEVELOP THE CREATIVE POTENTIAL OF SIXTH, SEVENTH AND EIGHTH GRADE STUDENTS, INCORPORATES IDEAS FROM A THREE-PART MODEL WHICH CONCEPTUALIZES THE COMPONENTS OF CREATIVITY AS APPROPRIATE CREATIVE ATTITUDES, VARIOUS COGNITIVE ABILITIES, AND IDEA-GENERATING TECHNIQUES. IT ATTEMPTS TO INCREASE STUDENTS' AWARENESS OF, AND APPRECIATION FOR, CHANGE AND INNOVATION; PROVIDE EXERCISE FOR CREATIVE ABILITIES WHICH FACILITATE THE FLUENT PRODUCTION OF ORIGINAL IDEAS; TEACH TECHNIQUES FOR THE SYSTEMATIC PRODUCTION OF NEW IDEA COMBINATIONS; AND, THROUGH HUMOR, TO CREATE A FREE ATMOSPHERE ENCOURAGING SPONTANEITY AND IMAGINATION. IN A PRELIMINARY FIELD TEST, RESPONSES TO AN ATTITUDE QUESTIONNAIRE AND THREE DIVERGENT PRODUCTION TASKS (SUCH AS THINKING OF CHANGES AND IMPROVEMENTS FOR A DOORKNOB) SHOWED THE PROGRAM TO BE EFFECTIVE. TWENTY-THREE SUBJECTS (21 SEVENTH AND TWO EIGHTH GRADE STUDENTS) WHO STUDIED THE PROGRAM IN A 10-WEEK CREATIVE THINKING COURSE PRODUCED 65% MORE IDEAS ON THE DIVERGENT THINKING TASKS (IDEAS WHICH WERE RATED AS SIGNIFICANTLY MORE CREATIVE) THAN 32 SEVENTH GRADE CONTROL SS ENROLLED IN A CREATIVE WRITING COURSE. THERE ALSO WAS GOOD INDICATION THAT THE TRAINED SS ACQUIRED MORE CREATIVE ATTITUDES, INCLUDING CONFIDENCE IN THEIR OWN CREATIVE ABILITY, THAN THE CONTROL SS. (AUTHOR/RJ)

TECHNICAL REPORT NO. 104

A PROGRAM FOR TRAINING CREATIVE THINKING:

I. PRELIMINARY FIELD TEST

REPORT FROM THE TASK AND TRAINING VARIABLES IN HUMAN PROBLEM SOLVING AND CREATIVE THINKING PROJECT

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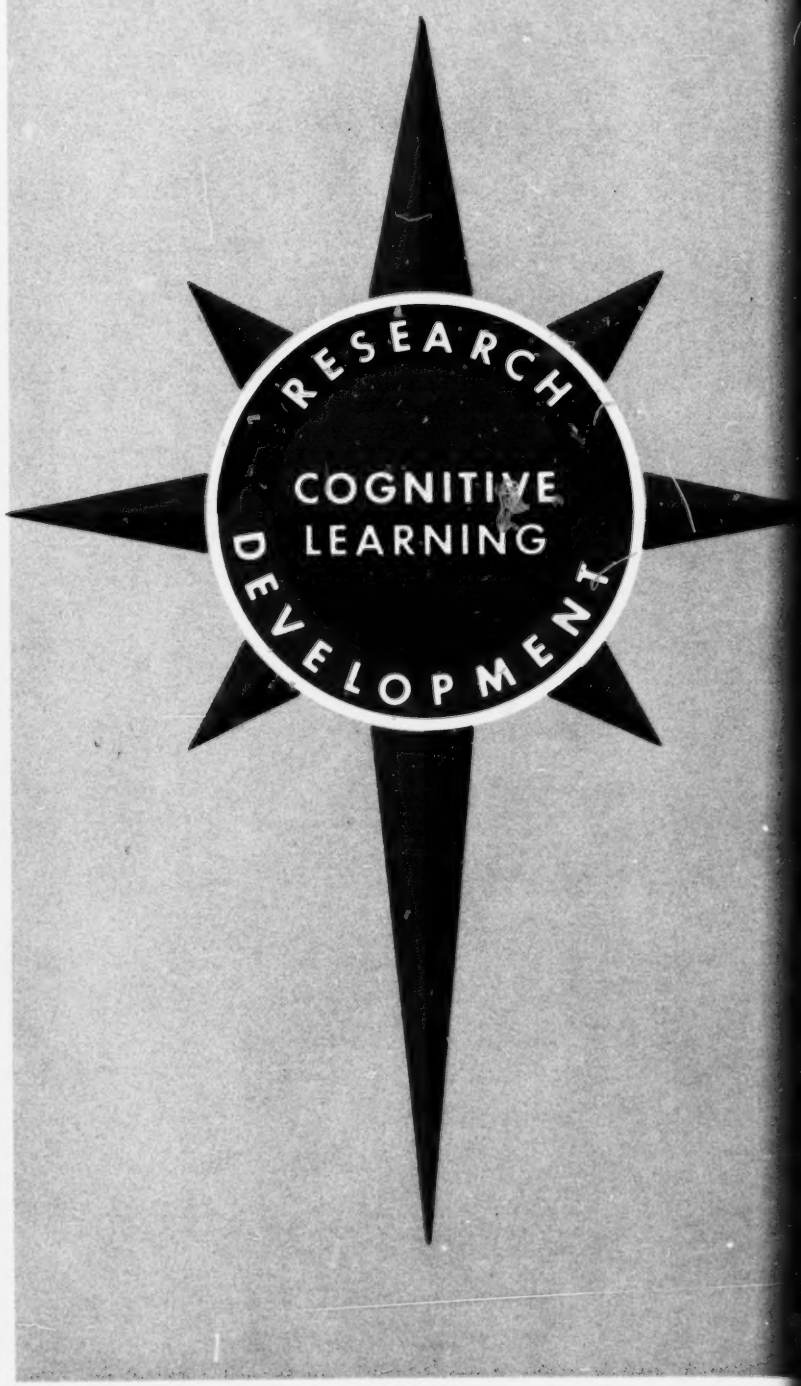

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Technical Report No. 104

A PROGRAM FOR TRAINING CREATIVE THINKING:

I. PRELIMINARY FIELD TEST

By Gary A. Davis, Susan E. Houtman,
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Report from the Task and Training Variables in
Human Problem Solving and Creative Thinking Project
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Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

November 1969

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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This Technical Report is from the Task and Training Variables in Human Problem Solving and Creative Thinking Project in Program 1. General objectives of the Program are to generate new knowledge about concept learning and cognitive skills, to synthesize existing knowledge, and to develop educational materials suggested by the prior activities. Contributing to these Program objectives, this project is focused on investigating creative problem solving as a trainable cognitive skill. The development and testing of creative thinking programs follows research on basic problem-solving variables in different situations.

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ABSTRACT

A three-part model conceptualizing the components of "creativity" as (1) appropriate creative attitudes, (2) various cognitive abilities, and (3) idea-generating techniques, suggests a structured approach for improving creative thinking. Thinking Creatively: A Guide to Training Imagination, a program designed to develop the creative potential of Sixth-, Seventh- and Eighth-Grade students, incorporates many concepts and principles of this three-part model. It attempts to: increase students' awareness of, and appreciation for, change and innovation; provide exercise for creative abilities which facilitate the fluent production of original ideas; teach techniques for the systematic production of new idea combinations; and, through humor, to create a free atmosphere encouraging spontaneity and imagination.

In a preliminary field test, responses to an attitude questionnaire and three divergent production tasks (such as thinking of changes and improvements for a doorknob) showed the program to be effective. Twenty-three Ss (21 Seventh- and 2 Eighth-Grade students) who studied the program in a 10-week creative thinking course produced 65% more ideas on the divergent thinking tasks (ideas which were rated as significantly "more creative") than 32 Seventh-Grade control Ss enrolled in a creative writing course. There also was good indication that the trained Ss acquired more creative attitudes, including confidence in their own creative ability, than the control Ss.

I
INTRODUCTION

Stimulating or teaching creative thinking is generally accepted as an important goal of education. However, there have been relatively few answers to the obvious question: What do you teach when you "teach creativity?" In spite of considerable inherent differences in individual abilities, growing evidence indicates creative problem-solving skills can be increased (Davis, 1969; Davis, Manske, & Train, 1967; Edwards, 1968; Olton & Crutchfield, 1969; Parnes, 1962). Creative individuals appear to possess certain facilitative attitudes (awarenesses, sets, predispositions), various cognitive abilities which contribute to the production of new combinations of ideas, and they often use particular techniques for systematic idea generation. While strategies exist for strengthening genetically determined creative abilities through exercise (Myers & Torrance, 1964, 1965a, 1965b, 1966a, 1966b, 1968), it is the attitudes and techniques which more clearly may be defined and taught. The present experiment was a preliminary field-test of Thinking Creatively: A Guide to Training Imagination, a program designed to increase the creative potential of Sixth- to Eighth-Grade students by teaching appropriate attitudes and particular creative thinking techniques.

Attitudes may be defined as learned, emotionally toned predispositions to react consistently, favorably or unfavorably, towards persons, objects, or ideas (Klausmeier & Goodwin, 1966, p. 343). One of the most important attitudes contributing to creative development is simply a favorable reaction toward "wild," imaginative ideas, an attitude which would predispose S to produce imaginative ideas and be receptive to the "wild" ideas of others. Another important attitude conducive to creative behavior has been named "constructive discontent" (Parnes, 1966): the notion that virtually any object (literary, artistic, technological, or even such common objects as thumbtacks and doorknobs) can be changed for the better. Also important is an appreciation for the critical role of innovation in all aspects of our fast-changing society—especially in regard to one's own future occupation. Finally, the attitude that we can learn to be more productive and more original thinkers is both important and teachable.

In addition to attempting to teach attitudes, Thinking Creatively presents techniques for systematically producing new combinations of ideas. Most of these procedures are simplified forms of effective creative thinking techniques taught in many university and industrial creativity training programs (Davis, Manske, & Train, 1967; Edwards, 1968; Olton & Crutchfield, 1969; Parnes, 1962), and were originally derived from introspective reports of highly creative individuals.

One of the most basic is the PART-CHANGING method, an adaptation of Crawford's (1954) attribute listing procedure. The student learns to identify important attributes or parts of an object, considering each attribute as a source of potential improvement. For example, with an object as simple as a button, students learn to identify the attributes of size, shape, color, and material. By considering changes for each of these individual attributes, ideas for a large variety of buttons may be quickly produced. The PART-CHANGING procedure both sensitizes students to properties of objects and provides them with a simple yet effective means of innovation.

Another technique is the CHECKERBOARD method, a simplification of the morphological synthesis technique (Allen, 1962). Students first list specific ideas for changing one part of an object along one axis of a two-dimensional diagram, and specific ideas for another part along the other axis; novel idea combinations are found in the intersecting squares of the CHECKERBOARD. For example, if students were asked to "invent new kinds of vehicles which have never before been considered," they might list types of vehicle bodies along one axis, list

potential sources of vehicle power along the other axis, then examine the many idea combinations occurring in the cells of the matrix. Since this procedure invariably produces an enormous quantity of idea combinations in a very short period of time, the production of totally new ideas, some of which may be surprisingly valuable, is virtually guaranteed.

With the CHECKLIST procedure, students consider each item on a prepared list as a possible source of innovation in respect to a given problem. For example, a history book may serve as a "checklist" of ideas for writing themes or short stories; the Yellow Pages could provide ideas for vocational guidance or for uses and markets for new inventions. There also exist checklists designed specifically for creative problem solving. Thinking Creatively instructs students in the use of the lengthy idea checklist for improving objects shown in Appendix A, and in using the shorter, seven-item idea checklist:

Change Color
New Size
Change Shape
New Material
Add or Subtract Something
Rearrange Things
New Design

Other idea-finding techniques include using deliberate metaphorical activity, i.e., asking how other people, or even animals, plants, and insects, have solved similar problems (Gordon, 1961); proposing "ideal" or "perfect" problem solutions (such as having the problem solve itself), and then thinking of workable ways of implementing the perhaps far-fetched ideal solution; and thinking of how a given problem may be solved a hundred or thousand years in the future.

In Thinking Creatively, the above attitudes and creative thinking techniques are presented to the student in such a way that he should easily be able to comprehend and then apply them to a variety of short exercises in the program and, hopefully, to future educational, vocational, and other personal problems of his own. The content of the program is in the form of dialogue among four story characters: Dudley and Maybelle, a young boy and girl approximately the age of the students reading the program, their pet bear Max, who epitomizes "what creativity shouldn't be," and Mr. I, a backyard scientist-inventor who teaches the critical attitudes and techniques to the others. Throughout the program, the four friends attack numerous simple and complex problems: Mr. I explains the creative problem-solving procedures and attitudes likely to aid in solving a given problem, and Dudley, Maybelle, and sometimes Max use the principles to produce specific problem solutions.

Humor in the situations and dialogue provides a motivational vehicle intended to maintain students' interest as they learn. In addition, the humor contributes to the free atmosphere required for a spontaneous and uninhibited imagination.

In sum then, the purpose of the present research was to test, in a preliminary fashion, the effectiveness of Thinking Creatively for increasing the creative potential of junior high school students by teaching them certain attitudes and creative thinking procedures.

II
METHOD

SUBJECTS

Twenty-one Seventh- and two Eighth-Grade students who volunteered for a creative thinking course comprised the Experimental Group; Control Ss were 32 Seventh-Grade volunteers for a creative writing course.[1]

PROCEDURE

Over a period of 10 weeks, 45 minutes per day, the Experimental Ss studied the workbook Thinking Creatively: A Guide to Training Imagination (Davis & Houtman, 1968) which contained various techniques and attitudes (described above) assumed to increase creative potential. The instructor and students read through the program together in class, often discussing the principles and procedures of creative thinking.

Exercises at the end of each chapter, which were discussed and solved as a class, provided practice with a given creative thinking procedure and gave Ss an opportunity to be imaginative, open-minded, and flexible. The instructor occasionally devised additional problems for the class to solve.[2]

DEPENDENT MEASURES

At the end of the 10 weeks, Ss in the Experimental and Control Groups worked on three problem-solving tasks. The first (Hot Dog) problem asked Ss to "Pretend you are going to open a hot-dog stand at the State Fair. You would like to have some new and different kinds of hot-dogs—new kinds of wieners or buns or both. How many ways can you think of to invent some new kinds of hot-dogs? You will have 15 minutes." For the second (Doorknob) problem, the instructions were to "List as many ways as you can to change or improve a doorknob. You will have 10 minutes." In the third (Hanger) problem, students were asked to "Think of different ways to use a wire coat hanger. What are they? You will have 10 minutes." Accompanying each problem statement were two pages containing 33 numbered blanks. The Ss were advised that they could write on the backs of these pages if additional space were needed.

For each of the three tests, six dependent measures were available:

(1) Total number of responses

(2) Mean "originality" (or uniqueness) as rated on a 7-point scale, "very common" to "very rare," by judges

(3) Number of original ideas (ideas rated above the "originality" scale midpoint, "4")

(4) Mean "practicality" (or usefulness, feasibility) as rated on a 7-point scale, "very impractical" to "very useful," by judges

(5) Number of practical ideas (ideas rated above the "practicality" scale midpoint, "4")

(6) Number of ideas rated above scale midpoints on both originality and practicality.

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[1]The authors are very grateful for the excellent cooperation and assistance of Miss Gretchen Collins, Assistant Principal, Mr. Robert Mull, instructor of the creative thinking course, and Mrs. Donna Waterston, who taught the creative writing course, all of Central School, Glencoe, Illinois.

[2]Several of Mr. Robert Mull's exercises have been incorporated into the final revision of Thinking Creatively.

The Ss in both groups were also given an 18-item attitude questionnaire designed to detect individuals' feelings about creativity in general and in relation to themselves. More specifically, this questionnaire (reproduced in Appendix B) sought to determine Ss' appreciation for and receptivity to imaginative ideas, their awareness of creativity and innovation, and their perception of their own creative capacity. Instructions on the cover of the questionnaire advised students that "These questions deal with how you feel about new ideas and thinking. For each question, place a checkmark in the blank which best describes the degree to which you think that the statement is true. There are no 'right' or 'wrong' answers; just be honest." A 9-point scale, in the form of 9 numbered blanks, appeared after each of the 18 questions. Three of the scale points were labelled "Never True" (1), "One-Half True" (5), and "Always True" (9).

For additional information on Thinking Creatively, 20 of the Experimental Ss responded to five questions intended to determine if they felt the program was difficult to read or understand, if it was interesting and enjoyable, and if the exercises seemed too complex.

III
RESULTS

CREATIVITY TESTS

Since four Experimental (both Eighth-Grade plus two Seventh-Grade students) and two Control Ss did not take all three tests, these six Ss were eliminated, leaving a final N for the Experimental Group of 19 Ss and for the Control Group of 30 Ss.

Hot Dog Problem

Mean performance scores for Ss in the Experimental and Control Groups, for all six dependent measures, are summarized in Table 1. The results of separate analyses of variance on these data also appear in Table 1. It can be seen that the trained Experimental Ss performed in an impressively more creative fashion than did the Control Ss. The Ss in the Experimental Group produced reliably more ideas which, on the average, were rated as more original. Experimental Ss also produced a significantly greater number of ideas scored above the scale midpoint ("4") in "Originality," and significantly more ideas scored above the scale midpoints in both "originality" and "practicality." The finding that Control Group ideas were rated as significantly more "practical," compared with ideas listed by Experimental Ss, was not surprising since earlier studies consistently showed a strong negative relationship between

Table 1

Summary of Results: Hot Dog Problem

Dependent Measure	Group Means		$F_{1,47}$	$p <$
	Experimental	Control		
Mean No. Ideas	24.26	15.80	12.22	.001
Mean Originality Rating (7-point Scale)	4.51	4.05	6.11	.02
Mean Practicality Rating (7-point Scale)	4.21	4.94	15.84	.001
Mean No. Ideas Above Scale Midpoint in Originality	8.00	3.80	5.84	.02
Mean No. Ideas Above Scale Midpoint in Practicality	9.47	7.50	1.50	
Mean No. Ideas Above Scale Midpoint in Originality and Practicality	1.89	1.30	10.50	.002

rated originality and rated practicality (Manske & Davis, 1968). In the Hot Dog Problem, the Pearson correlation between the originality and practicality ratings was $r = -.61$.

Doorknob Problem

Mean performance scores and their related F's are summarized in Table 2. Again, creative production by the trained Ss was strikingly superior to that of the Control Ss. Experimental Ss produced significantly larger numbers of ideas, their mean originality ratings were higher, they listed more ideas rated above the scale midpoint in "originality," and they generated more ideas rated as both "original" and "practical." Unlike the "practicality" rating results in the Hot Dog Problem, with the Doorknob Problem the Control Ss' ideas were not rated as significantly more practical than the ideas of the Experimental Ss, although the negative relationship between originality and practicality was again evident ($r = -.46$).

Coat Hanger Problem

The results of the Coat Hanger Problem appear in Table 3. As with the other two problems, Experimental Ss produced significantly more ideas, which were rated as higher in originality, and greater numbers of ideas rated in the upper half of the originality scale. The Experimental and Control Ss did not differ significantly in mean practicality ratings nor in the numbers of ideas rated above average in both originality and practicality.

ATTITUDE QUESTIONNAIRE

Eighteen Experimental (16 Seventh- plus the two Eighth-Grade) Ss and 32 Control Ss completed the attitude questionnaire (Appendix B), an experimenter-designed instrument intended to detect attitudes related to creative thinking. Analyses of variance on each of the 18 items showed just three of these items to reflect strong attitudinal differences between the Experimental and Control Ss. Four more items showed "suggestive" differences between the two groups. With one of these items (Item 16), the Control Ss responded in the more creative direction. The particular items, Experimental and Control Group means, F's, and associated probabilities appear in Table 4.

Generally, the questionnaire results provide some qualified support for the hypotheses that Thinking Creatively will increase a student's confidence in his ability to be creative (Items 10 and 7), increase his awareness of creative innovation (Items 1 and 17), and increase his appreciation for the importance of unusual ideas in creative problem solving (Items 5 and 14).

Table 2

Summary of Results: Doorknob Problem

Dependent Measure	Group Means Experimental	Control	$F_{1,47}$	$p <$
Mean No. Ideas	21.16	14.13	5.52	.02
Mean Originality Rating (7-point Scale)	4.76	4.16	9.54	.003
Mean Practicality Rating	4.30	4.38	.16	
Mean No. Ideas Above Scale Midpoint in Originality	8.11	2.87	19.56	.0001
Mean No. Ideas Above Scale Midpoint in Practicality	6.47	4.87	1.44	
Mean No. Ideas Above Scale Midpoint in Originality and Practicality	1.58	.600	10.95	.002

Table 3

Summary of Results: Coat Hanger Problem

Dependent Measure	Group Means Experimental	Control	$F_{1,47}$	$p <$
Mean No. Ideas	20.68	10.83	13.18	.001
Mean Originality Rating	4.58	3.43	9.49	.004
Mean Practicality Rating	3.63	3.87	.35	
Mean No. Ideas Above Scale Midpoint in Originality	9.37	3.20	20.74	.0001
Mean No. Ideas Above Scale Midpoint in Practicality	4.16	3.67	.31	
Mean No. Ideas Above Scale Midpoint in Originality and Practicality	.05	.23	1.25	

Table 4

Summary of Attitude Questionnaire Results

Item	Group Means Experimental	Control	$F_{1,48}$	$p <$
[a]1. Just about anything in the world could be changed for the better.	7.28	6.66	1.46	.23
[b]5. Creative thinkers do not spend time on wild ideas.	2.22	4.16	7.92	.007
[a]7. I think my ideas are about as good as anyone else's.	6.22	5.31	2.08	.16
[a]10. I think I am creative.	6.28	5.16	3.91	.05
[b]14. It's best to make sure an idea is a good one before suggesting it to a group.	3.78	6.56	17.08	.001
*[b]16. I usually criticize wild ideas, no matter who produces them.	4.00	3.03	1.99	.16
[a]17. I often look for better ways of doing things.	7.11	6.28	2.38	.13

[a]Higher score considered more creative.

[b]Lower score considered more creative.

*Control group responded more creatively.

The results with Item 16, suggesting that the trained Experimental Ss are more critical of "wild" ideas than the Control Ss, are unexplainable. Item 16 was one of six items (Items 5, 8, 13, 14, 16, 18; see Appendix B) intended to measure Ss' appreciation for and receptiveness to unusual, innovative ideas—attitudes given considerable emphasis in Thinking Creatively. All items except Item 16 showed the Experimental Ss to respond in the more creative direction; with Items 5 and 14, the differences were statistically significant.

ADDITIONAL INFORMATION

Sixteen Experimental Ss responded to the five questions shown in Table 5. It can be seen that most of the Ss who studied Thinking Creatively felt the program was not difficult to read or understand, nor were the exercises too difficult. The majority of their responses also indicated that, "compared with other books or workbooks," Thinking Creatively was interesting and enjoyable.

Table 5

Summary of Student Evaluations

Item	Frequency			
	Yes	No	Sometimes	No Opinion
1. Was the program, "Thinking Creatively," difficult to read?	0	13	3	0
2. Was the program, "Thinking Creatively," difficult to understand?	0	14	2	0
3. Were the exercises too difficult?	0	9	6	1
4. Compared with other books or workbooks, did you find the program interesting?	10	3	1	2
5. Compared with other books or workbooks, did you find the program enjoyable?	9	3	3	1

IV
DISCUSSION

The overall results of this preliminary field test are very encouraging. With the brief "creativity" tests, Ss in the Experimental Group produced 54% (Hot Dog Problem), 50% (Doorknob Problem), and 91% (Coat Hanger Problem) more ideas than the Control Ss. Also, the ideas of the trained Ss were rated as significantly more "original" than the ideas of the Control Ss. Furthermore, while the results of the attitude questionnaire were not overwhelmingly strong nor completely unambiguous, they definitely suggest that the Experimental Ss did indeed feel more creative, more appreciative of imaginative or "wild" ideas, and more aware of the importance of change and innovation after training.

While these results are considered favorable, certain qualifications must be noted. First of all, it is difficult to determine whether the superior performance of the Experimental Ss was due entirely to the training program, to the creative behavior of the particular instructor, or to some combination of these two. Discussions with the instructor and informal observations of student-teacher interaction left little doubt that the instructor contributed greatly to an open and creative atmosphere by directly encouraging imaginative behavior. Consequently, though we assume the program to be mainly responsible for the positive results, it is difficult to determine the exact extent of its contributions independent of those of the instructor.

Subject selection also was not random, with the Experimental Group comprised of volunteers for a course in creative thinking. While such a sampling procedure may favor more creative Ss, the Control Group, comprised of volunteers for a creative writing course, should also attract more creative Ss. The teachers of the Experimental and Control Groups, and an assistant principal who also was familiar with the students involved, felt the two groups were indeed comparable in initial creative ability.

Another question relates to the validity of the "creativity tests" for measuring "true," long-term creative ability. That is, can the fluent and original performance of Ss in the Experimental Group on our three idea-production tasks be taken to mean that these students are truly "more creative" than the Control Ss? The criterion problem, concerning the difficulty of measuring creative ability, certainly is not unique to the present experiment and, unfortunately, the present authors cannot satisfactorily answer this question better than others. For research purposes, we must assume that Ss' test performance is a "fair" predictor of future open-minded and imaginative behavior. Studies validating similar tests against numerous criteria of creative ability lend support to this assumption (Torrance, 1965, 1967).

Regarding the 18-item attitude questionnaire, only three items differentiated the Experimental and Control Groups beyond the .05 significance level; four more items were suggestive of differences between the two groups. It is difficult, therefore, to determine whether most of the items were insensitive to "true" differences between the Experimental and Control Groups, or if these differences simply were very slight. Also, with those differences which did occur (see Table 4 on page 7), one might ask whether the responses of the Experimental Ss to the questionnaire were the "right" answers, as taught in the program, or if the attitudes of these Ss were truly altered in a more creative direction. It is important to note that some items, to which the Experimental Ss responded more creatively than the Control Ss, reflect attitudes not directly taught in the program:

Item 7. "I think my ideas are about as good as anyone else's."

Item 10. "I think I am creative."

Item 17. "I often look for better ways of doing things."

Generally then, the available questionnaire data do suggest that the Experimental Ss acquired more creative attitudes. Of particular interest is the finding that the Experimental Ss showed more confidence in their creative ability (Items 7 and 10), a finding which often occurs after systematic training in creative thinking (Mason, 1960; Parnes, 1962). Furthermore, the very favorable performance of the Experimental Ss on the three idea-production tests provides strong evidence that these Ss had acquired attitudes associated with liberally producing imaginative ideas.

Despite some difficulties, the results of this preliminary field test provide considerable evidence that the program Thinking Creatively: A Guide to Training Imagination is effective in increasing the creative potential of (mainly) Seventh-Grade students. Based upon these results, the authors (Davis & Houtman, 1968) have revised Thinking Creatively, primarily by adding exercises, shortening some chapters, and generally polishing the dialogue. Future large-scale field studies of the revised program, using modified tests and questionnaires, should provide information regarding the effectiveness of this program for different age and ability levels along with producing additional evidence for the effectiveness of the program for increasing creative potential in the schools.

REFERENCES

Allen, M. S. Morphological creativity. Englewood Cliffs, N. J.: Prentice-Hall, 1962.

Crawford, R. P. The techniques of creative thinking. New York: Hawthorn, 1954.

Davis, G. A. Training creativity in adolescence: A discussion of strategy. In R. E. Grinder (Ed.), Studies in adolescence. II. New York: Macmillan, 1969, in press. Reprinted in Journal of Creative Behavior, 1969, in press.

Davis, G. A., & Houtman, S. E. Thinking Creatively: A guide to training imagination. Wisconsin Research and Development Center for Cognitive Learning, University of Wisconsin, 1968.

Davis, G. A., Manske, M. E., & Train, A. J. Training creative thinking. Occasional Paper No. 6, Wisconsin Research and Development Center for Cognitive Learning, University of Wisconsin, 1967.

Edwards, M. O. A survey of problem solving courses. Journal of Creative Behavior, 1968, 2, 33-51.

Gorden, W. J. J. Synectics. New York: Harper, 1961.

Klausmeier, H. J., & Goodwin, W. Learning and human abilities. New York: Harper, 1966.

Manske, M. E., & Davis, G. A. Effects of simple instructional biases upon performance in the Unusual Uses Test. Journal of General Psychology, 1968, 79, 25-33.

Mason, J. G. How to be a more creative executive. New York: McGraw-Hill, 1960.

Myers, R. E., & Torrance, E. P. Invitations to thinking and doing. Boston: Ginn, 1964.

Myers, R. E., & Torrance, E. P. Can you imagine? Boston: Ginn, 1965. (a)

Myers, R. E., & Torrance, E. P. Invitations to speaking and writing creatively. Boston: Ginn, 1965. (b)

Myers, R. E., & Torrance, E. P. For those who wonder. Boston: Ginn, 1966. (a)

Myers, R. E., & Torrance, E. P. Plots, puzzles and ploys. Boston: Ginn, 1966. (b)

Myers, R. E., & Torrance, E. P. Stretch. Minneapolis: Perceptive, 1968.

Olton, R. M., & Crutchfield, R. S. Developing the skills of productive thinking. In P. Mussen, J. Langer, and M. V. Covington (Eds.), New directions in developmental psychology. New York: Holt, 1969, in press.

Parnes, S. J. Can creativity be increased? In S. J. Parnes & H. F. Harding (Eds.), A source book for creative thinking. New York: Scribner's, 1962, Pp. 185-191.

Parnes, S. J. Workbook for creative problem solving institutes and courses. Buffalo: Creative Education Foundation, 1966.

Torrance, E. P. Rewarding creative behavior. Englewood Cliffs, N. J.: Prentice-Hall, 1965.

Torrance, E. P. The Minnesota studies of creative behavior. Journal of Creative Behavior, 1967, 1, 137-155.

APPENDIX A

MR. I'S CHECKLIST FOR NEW IDEAS

Change Color?

Blue
Green
Yellow
Orange
Red
Purple
White
Black
Olive Green
Grey
Brown
Tan
Silver
Gold
Copper
Brass
Plaid
Striped
Polka-dotted
Psychedelic
Flowers
Speckles
Paisley
Pop Art
Other Colors?
Color Combination?
Other Patterns?

New Size?

Longer
Shorter
Wider
Fatter
Thinner
Thicker
Higher
Lower
Larger
Smaller
Jumbo
Minature
Other Size?

Change Shape?

Round
Square
Triangle
Oval
Rectangle
5-Sided
6-Sided
8-Sided
10-Sided
Lop-Sided
Sharp Corners
Round Corners
Egg-Shaped
Doughnut-Shaped
"U" Shaped
Other Shapes?

New Material?

Plastic
Glass
Fiberglass
Formica
Paper
Wood
Aluminum
Nylon
Cloth
Gunny Sack (Burlap)
Cardboard
Steel
Leather
Copper
Rubber
Other Material?
Combination of These Materials?

Add Or Subtract Something?

Make Stronger
Make Faster
Exaggerate Something
Duplicate Something
Remove Something
Divide
Make Lighter
Abbreviate
Add New Do-Dad
Add New Smell
New Sound
New Lights
New Flavor
New Beep Beep
New Jingle Jingle
Subtract The Thing That Doesn't Do Anything

Rearrange Things?

Switch Parts
Change Pattern
Combine Parts
Other Order of Operation
Split Up
Turn Backward
Upside Down
Inside Out
Combine Purposes
Other Switcheroo?

New Design?

From Other Countries?
- Oriental design
- Swedish design
- Mexican design
- French design
- Eskimo design
- Russian design
- American design
- Indian design
- Egyptian design
- Spanish design

From Other Time?
- Old West
- Roaring Twenties
- Past Century
- Next Century
- Middle Ages
- Cave Man
- Pioneer

From Other Styles?
- Hippie
- Beatnik
- Other Weirdos
- Ivy League
- Secret Agent
- Elves and Fairies
- Clown
- Football Uniform

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APPENDIX B

Attitude Questionnaire

Name _____ Grade _____

Sex _____

These questions deal with how you feel about new ideas and thinking. For each question, place a checkmark (✓) in the blank which best describes the degree to which you think that the statement is true. For example:

	Never True				One-half True				Always True
1. I enjoy new activities.	1	2	3	4	(5)	6	7	8	9

There are no "right" or "wrong" answers, just be honest.

	Never True				One-half True				Always True
1. Just about anything in the world could be changed for the better.	1	2	3	4	(5)	6	7	8	9
2. I think I have a good sense of humor.	1	2	3	4	(5)	6	7	8	9
3. When solving problems, it's best to just find one or two good ideas, rather than thinking of lots of possible ideas.	1	2	3	4	(5)	6	7	8	9
4. Anyone can learn to think of new ideas.	1	2	3	4	(5)	6	7	8	9
5. Creative Thinkers do not spend time on wild ideas.	1	2	3	4	(5)	6	7	8	9
6. I often think about new ideas.	1	2	3	4	(5)	6	7	8	9
7. I think my ideas are about as good as anyone else's.	1	2	3	4	(5)	6	7	8	9
8. Unusual or wild ideas are usually of no help in solving a serious problem.	1	2	3	4	(5)	6	7	8	9
9. Finding new ideas is a mysterious ability that just a few people have.	1	2	3	4	(5)	6	7	8	9

	Never True				One-half True				Always True
10. I think I am creative.	1	2	3	4	(5)	6	7	8	9
11. Writers, scientists, and engineers need new ideas, but the average person doesn't.	1	2	3	4	(5)	6	7	8	9
12. Sometimes I am afraid my ideas might be laughed at.	1	2	3	4	(5)	6	7	8	9
13. Wild ideas can sometimes lead to good ideas.	1	2	3	4	(5)	6	7	8	9
14. It's best to make sure an idea is a good one before suggesting it to a group.	1	2	3	4	(5)	6	7	8	9
15. People can improve their memories, but they cannot learn to think better or get better ideas.	1	2	3	4	(5)	6	7	8	9
16. I usually criticize wild ideas, no matter who produces them.	1	2	3	4	(5)	6	7	8	9
17. I often look for better ways of doing things.	1	2	3	4	(5)	6	7	8	9
18. It's best to think only of good, practical ideas.	1	2	3	4	(5)	6	7	8	9

ADDENDUM

A study of the readability of Thinking Creatively by Gary A. Davis and Susan E. Houtman was performed by Joanne Strike of the Wisconsin Research and Development Center for Cognitive Learning using the Dale-Chall Formula for Predicting Readability.[1] Twenty 100-word samples were drawn from this book with two samples taken from each of the ten chapters. The average sentence length and the percentage of unfamiliar words were determined. When this information was applied to the Dale-Chall Formula, the results showed the predicted readability of Thinking Creatively to be 7th through 8th grade level.

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[1] Dale, Edgar and Jeanne Chall, "A Formula for Predicting Readability." Educational Research Bulletin, 1948, 27, 11-20.

Dale, Edgar and Jeanne Chall, "A Formula for Predicting Readability: Instructions." Educational Research Bulletin, 1948, 27, 37-54.

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